



**TECHNICAL REVIEW AND EVALUATION  
OF APPLICATION FOR  
AIR QUALITY PERMIT NO. 69780**

**Phoenix Cement Company**

**I. INTRODUCTION**

This Class I renewal permit is being issued to Phoenix Cement Company (PCC) , the Permittee, for the continued operation of the portland cement plant in Clarkdale, Yavapai County, Arizona. This permit renews and supersedes Operating Permit No. 54623.

**A. Company Information**

1. Facility Name: Phoenix Cement Company
2. Facility Location: 601 North Cement Plant Road  
Clarkdale, Yavapai County, Arizona 86324
3. Mailing Address: P.O. Box 428  
Clarkdale, Arizona 86324

**B. Attainment Classification**

The facility is located in attainment area for all criteria pollutants.

**II. PROCESS DESCRIPTION**

At the PCC facility, cement is produced from various types of rock, including limestone, volcanic ash, and mill scale. First, limestone and other types of rock are blasted and transported by haul trucks from the quarry to the primary crusher or to stockpiles. Crushed rock is routed to surge piles for subsequent transfer to the secondary crusher. The secondary crusher is used in conjunction with feeders and screens to further reduce the size of the rock before it is sent to the raw mill storage bays.

The crushed rock is conveyed from the storage bays to the raw mill for grinding via the rock bin, elevator, and separator. Meal-size material from the raw mill is transported to the blending system which is composed of two blending silos and one homogenizing silo. The in-line raw mill applies residual heat from the pre-heater flue whereas the existing separator and raw mill each have a dryer that supplies heated air. From the blending system, the meal is pumped via the alleviator into a bin from which the meal is discharged into the kiln.

The Portland cement manufacturing process consists of a state-of-the-art rotary kiln (Kiln 4) equipped with a five-stage, suspension pre-heater and in-line calciner. This system transforms the raw mix into clinker. The chemical reactions and physical processes that constitute the transformation are quite complex, but they can be conceptually divided into four stages, as a function of the location and temperature in the rotary kiln.

- Evaporation of uncombined water from raw materials as material temperature increases to 212°F;
- Dehydration, as the material temperature increases from 212°F to approximately 800°F to



form oxides of silicon, aluminum, and iron;

- Calcination, during which carbon dioxide (CO<sub>2</sub>) is evolved, between 1,650°F and 1,800°F to form free lime (CaO); and
- Reaction of the oxides in the burning zone of the rotary kiln to form cement clinker at temperatures of approximately 2,750°F.

The indirect-fired modern kiln burns a blend of coal and pet-coke. Coal and pet-coke are stored in separate piles from which each is conveyed into a shared crusher for crushing. The crushed coal or coke is sent to either coal bin or pet-coke bin that feeds a coal roller mill in certain blend ratio. The milled fuel blend is then sent to one of the two pulverized fuel bins for storage before being air-conveyed into the burning zone of the kiln.

Clinker discharges from the kiln into a clinker cooler. Clinker is removed from the clinker cooler by drag chains and moveable grates onto a common conveyor belt that transports it to two clinker storage domes.

### III. EMISSIONS

The facility is a major source as the potential to emit (PTE) is greater than 100 tons per year for carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), particulate matter (PM), and particulate matter nominally less than 10 microns (PM<sub>10</sub>). The facility is also a major source of hazardous air pollutants (HAPs) as it has the potential to emit in the aggregate, 10 tons per year (tpy) or more of a single HAP, or 25 tpy or more of multiple HAPs combined.

**Table 1 Potential Emissions**

Pollutant	Emissions (tons per year)
PM	773*
PM <sub>10</sub>	460*
PM <sub>2.5</sub>	275
NO <sub>x</sub>	3271*
CO	764*
SO <sub>2</sub>	401*
VOC	41.5*
GHG(expressed as CO <sub>2</sub> e)	1,201,869

\* These numbers are voluntarily emission limits/caps to avoid triggering the Prevention of Significant Deterioration (PSD) requirements.

Additionally, the facility is subject to the following emission limits:

Kiln 4/In-Line Raw Mill and Coal Mill Emission Limits (rolling 12-month total):

- NO<sub>x</sub>: 3,240 tons per year
- CO: 698 tons per year
- SO<sub>2</sub>: 400 tons per year



Kiln 4/In-Line Raw Mill and Coal Mill Emission Limits (rolling 8-hour average):

- CO: 2.0 pounds per ton of clinker (lb/ton)

Quarry Explosives Usage:

The quarry explosive usage limits, which were increased by the significant permit revision No. 46157, remain unchanged.

- 1473 tons per year (rolling 12-month total);
- 113 tons per calendar day; and
- 15 tons per hour

#### IV. APPLICABLE REGULATIONS

Table 2 displays the applicable requirements for each permitted piece of equipment along with an explanation of why the requirement is applicable.

**Table 2 Verification of Applicable Regulations**

Unit	Control Device	Rule	Verification
In-line Kiln-4/Raw Mill, Clinker Coolers, Finish Mills, Raw Material and Clinker Storage and Handling, Bulk Unloading and Loading, and Bagging Systems	Dust collectors	40 CFR 63 Subpart LLL 40 CFR 60 Subpart F	The facility is a major source of Hazardous Air Pollutant (HAP) emissions and is subject to NESHAPS requirements under 40 CFR 63 Subpart LLL.  Facilities constructed after August 17, 1971 are subject to 40 CFR 60 Subpart F. As per 40 CFR 63.1356, affected sources subject to the provisions of 40 CFR Subpart LLL are exempt from the otherwise applicable new source performance standard contained in 40 CFR 60 Subpart F, as the requirements under 40 CFR 63 Subpart LLL are more stringent.
Quarry and raw material storage and handling.	Dust collectors water sprays	A.A.C. R18-2-702 & -722, NSPS 40 CFR Part 60 Subpart OOO	NSPS 40 CFR Part 60 Subpart OOO is applicable to equipment constructed after August 31, 1983.  For the equipment constructed prior to August 31, 1983, A.A.C R18-2-722 and 702 are applicable.



Unit	Control Device	Rule	Verification
Coal Preparation Plant	Dust collectors	A.A.C. R18-2-702.B.1 40 CFR 63 Subpart LLL A.A.C. R18-2-716	<p>Since the coal mill uses kiln exhaust gases, this is considered inline coal mill and subject to NESHAP standards 40 CFR 63 subpart LLL as per 40 CFR 63.1340(b)(1).</p> <p>Also, as per 40 CFR 63.1340(b)(7), each conveying system transfer point associated with coal preparation used to convey coal from the mill to the kiln is subject to 40 CFR 63 Subpart LLL.</p> <p>Other equipment in the coal preparation plant are subject to Arizona A.A.C R18-2-716 if these are constructed prior to October 28, 1974. The equipment constructed and modified after October 28, 1974 are subject to 40 CFR 60 Subpart Y.</p>
Diesel Engine	None	A.A.C. R18-2-719	<p>Existing stationary rotating machinery is subject to requirements under A.A.C. R18-2-719.</p> <p>The engine is not subject to NSPS Subpart IIII because it was constructed prior to April 1, 2006.</p> <p>The National Emission Standard for Hazardous Air Pollutants (NESHAP) Subpart ZZZZ is applicable to reciprocating internal combustion engines (RICE) located at major and area sources of HAPs. Existing emergency stationary RICE greater than 500 HP and constructed before December 19, 2002 do not have to meet the requirements of 40 CFR §63 Subpart ZZZZ (40 CFR §63.6590(b)(3)).</p>



Unit	Control Device	Rule	Verification
Natural Gas-fired furnace and cooling towers	None	A.A.C. R18-2-730	These requirements are applicable to unclassified sources.
Fugitive dust sources	Water Trucks Dust Suppressants	A.A.C. R18-2 Article 6 A.A.C. R18-2-702	These standards are applicable to all fugitive dust sources at the facility.
Abrasive Blasting	Wet blasting; Dust collecting equipment; Other approved methods	A.A.C. R-18-2-702 A.A.C. R-18-2-726	These standards are applicable to any abrasive blasting operation.
Spray Painting	Enclosures	A.A.C. R18-2-702 A.A.C. R-18-2-727	This standard is applicable to any spray painting operation.
Demolition/renovation operations	N/A	A.A.C. R18-2-1101.A.8	This standard is applicable to any asbestos related demolition or renovation operations.
Mobile sources	None	A.A.C. R18-2-801	These are applicable to off-road mobile sources, which either move while emitting air pollutants or are frequently moved during the course of their utilization.
Quarry and raw material storage and handling.	Dust collectors water sprays	A.A.C. R18-2-702 & -722, NSPS 40 CFR Part 60 Subpart OOO	NSPS 40 CFR Part 60 Subpart OOO is applicable to equipment constructed after August 31, 1983.  For the equipment constructed prior to August 31, 1983, A.A.C R18-2-722 and 702 are applicable.

## V. PREVIOUS PERMIT CONDITIONS

Permit No. 54623 was issued on July 25, 2013, for the continued operation of this facility. **Table 3** and **Table 4** below illustrate if a section in Permit No. 54623 was revised or deleted.



**Table 3 Permits Issued since last renewal**

Permit No.	Type of Permit	Description	Date of Issue
58258	317 Change	Cooling Tower Replacement	June 13, 2013
63330	Minor Permit Revision	PC MACT Compliance extension and Addition of gasoline and diesel storage tanks	February 24, 2016
65122	Minor Permit Revision	Installation of Clinker Feed Loadout System	February 1, 2017
65752	Minor Permit Revision	Addition of 5 dust collectors	May 26, 2017
69509	Minor Permit Revision	Addition of SNCR Requirements	February 28, 2018

**Table 4 Permit No. 69780**

Section No.	Determination		Comments
	Revised	Delete	
Att. A.	X		General Provisions - Revised to represent most recent template language.
Att. B		III	<i>National Emission Standards For Hazardous Air Pollutants (NESHAP) Requirements Until September 9, 2015</i> Section removed. No longer applies.
Att. B		IV	<i>National Emission Standards For Hazardous Air Pollutants (Neshap) Requirements For Clinker Storage Piles Effective Between February 12, 2014 And September 9, 2015</i> Section removed. Phoenix Cement has submitted an operation and maintenance plan for operation of open clinker piles.
Att. B	III.B		<i>National Emission Standards For Hazardous Air Pollutants (NESHAP) Requirements</i> Section updated to include most recent final rule. (Previously Section V)
Att. B		III.C	Condition B.5 removed.
Att. B	III		Condition H.3.b(1) revised to represent most recent language updates.
Att. B	III		Condition D.2.b has updated regulatory citation.
Att. B	III		Condition C.4 revised to represent most recent language updates.
Att. B	III		Condition D.4.g revised to represent most recent language updates.
Att. B	III		Condition I.1.a(3) revised to represent most recent language updates.
Att. B	III		Condition I.2.b(6) revised to represent most recent language updates.
Att. B	III		Condition J.1.d revised to represent most recent language updates.
Att. B	III		Condition K.1.a(3) revised to represent most recent language updates.
Att. B	III		Condition K.1.e added to represent most recent language updates.
Att. B	III		40 CFR 63.1355(d) was removed from the permit as it was removed from the rule.



Section No.	Determination		Comments
	Revised	Delete	
Att. B		XII	<i>Ambient Monitoring Requirements</i> Section removed.
Att. B	XVI		<i>Regional Haze Requirements</i> Section added in Minor Permit Revision No. 65122
Att. C	XVI		Selective Non-Catalytic Reduction equipment added in Minor Permit Revision No. 65122

## VI. MONITORING AND TESTING REQUIREMENTS

### A. Facility Wide Requirements

#### 1. Compliance with voluntary Limits

- a. The Permittee is required to operate CEMS on the Kiln 4 S-401 and the coal mill stack S-453 for carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>) and sulfur dioxide (SO<sub>2</sub>) emissions to continuously monitor compliance with the voluntary limits taken to avoid triggering prevention of significant deterioration (PSD)
- b. The Permittee is required to install, maintain and operate a permanent weigh scale system to measure and record weight rates in tons-mass per hour of the amount of clinker produced by Kiln 4.
- c. The Permittee is required to demonstrate compliance with by calculating and maintaining records the rolling 12-month emissions of PM, PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub> and CO and VOC separately.

### B. National Emission Standards for Hazardous Air Pollutants (NESHAP) Requirements - Subpart 40 CFR 63 Subpart LLL

#### 1. Exhaust Gas Flow Rate

- a. To demonstrate compliance with lb/ton of clinker limits for PM<sub>10</sub> and mercury, the Permittee is required to install and operate instruments for continuously measuring and recording the stack gas flow rates for Kiln 4 stack and the coal mill stack and the clinker cooler stack.
- b. Instead of monitoring the exhaust gas flow rate for the coal mill stack, the Permittee may use the maximum design exhaust gas flow rate. For purposes of determining the combined emissions from kilns that exhaust kiln gases to a coal mill that exhausts through a separate stack, instead of installing a CEMS on coal mill stack, you may use the results of the initial and subsequent performance test to demonstrate compliance with the relevant emissions limit.

#### 2. Particulate Matter (PM)

The Permittee is required to use a continuous parametric monitoring system (CPMS) on the Kiln 4 stack S-401 and clinker cooler stack S-402 to demonstrate continuous compliance with the operating limit established during the performance test.



3. D/F

- a. The Permittee is required to monitor and record the temperature of the exhaust gases from the Kiln 4 at the inlet to PM control device DC-431. The run average temperature are required to be maintained within exhaust temperature limits established during the performance tests for D/F while In-Line Raw Mill RM-306 is operating under normal operating conditions and while In-Line Raw Mill RM-306 is not operating, except during periods of startup/shutdown when the temperature limit may be exceeded by no more than 10 percent.
- b. If the Permittee uses sorbent injection for D/F control, the Permittee is required to continuously monitor and maintain the rate of activated carbon injection within the limits established during the performance tests. The Permittee is also required to continuously monitor and maintain the activated carbon injection system carrier gas parameter (either the carrier gas flow rate or the carrier gas pressure drop) within the limits established during the performance tests.

4. Total Hydrocarbons (THC)

- a. The Permittee is required to install and operate a THC continuous emission monitoring system on the Kiln Stack S-401, Coal Mill Stack S-453, Raw Mill DC-301 and Swing Mill DC302 when used for raw material grinding in accordance with Performance Specification 8A of appendix B to 40 CFR 60.
- b. Instead of THC, the Permittee may choose to comply with the total organic HAP emissions limits. The Permittee shall, at the same time of conducting the performance test for total organic HAP, determine a site-specific THC emissions limit by operating a THC CEMS.
- c. Instead of installing a CEMS on the coal mill stack S-453, the Permittee may use the results of the initial or subsequent performance test to demonstrate compliance with the THC emission limit. The THC shall be measured either upstream of the coal mill or coal mill stack.

5. Mercury

- a. The Permittee is required to install and operate a mercury CEMS or an integrated solvent trap monitoring system on the Kiln Stack S-401.
- b. For the coal mill, the Permittee is required to conduct annual performance tests to measure the concentration of mercury in the gases exhausted from the coal mill. The Permittee must, on continuous basis, determine the mass emissions of mercury in lb/hr from the coal mill exhausts by using the mercury hourly emissions rate and the exhaust gas flow rate. The Permittee then shall sum the hourly mercury emissions from the kiln and coal mill to determine total mercury emissions, and using hourly clinker production, calculate the hourly emissions rate in pounds per ton of clinker to determine the 30 day rolling average.

6. Hydrochloric Acid (HCl)





- a. The Permittee is required to install and operate HCl CEMS on the Kiln Stack S-401 and the coal mill stack S-453.
- b. Instead of installing a CEMS on the coal mill stack, the Permittee may use the results of the initial or subsequent performance test to demonstrate compliance with the HCl emission limit. HCl shall be measured either upstream of the coal mill or coal mill stack.

**C. Fugitive Dust**

1. The Permittee is required to keep record of the dates and types of dust control measures employed.
2. The Permittee is required to show compliance with the opacity standards by having a Method 9 certified observer perform survey of visible emission from fugitive dust sources at the frequency specified in the permit. The observer is required to conduct a 6-minute Method 9 observation if the results of the initial survey appear on an instantaneous basis to exceed the applicable standard.
3. The Permittee is required to keep records of the name of the observer, the time, date, and location of the observation and the results of all surveys and observations.
4. The Permittee is required to keep records of any corrective action taken to lower the opacity of any emission point and any excess emission reports.

**D. Periodic Activities**

1. The Permittee is required to record the date, duration and pollution control measures of any abrasive blasting project.
2. The Permittee is required to record the date, duration, quantity of paint used, any applicable MSDS, and pollution control measures of any spray painting project.
3. The Permittee is required to maintain records of all asbestos related demolition or renovation projects. The required records include the "NESHAP Notification for Renovation and Demolition Activities" form and all supporting documents.

**E. Mobile Sources**

The Permittee is required to keep records of all emission related maintenance performed on the mobile sources.

**F. Ambient Monitoring Requirements**

The Permittee was required to operate, maintain, and calibrate an ambient PM<sub>10</sub> sampling network at two existing sampling sites in accordance with 40 CFR Part 50 and 58. These monitoring requirements were imposed prior to stricter federal requirements under NESHAP Subpart LLL. Figure 1 demonstrates the highest average concentrations for 4 years, all measurements of which are substantially below the 24-hour PM<sub>10</sub> National Ambient Air Quality Standard of 150 µg/m<sup>3</sup>. Based on the regulatory changes and the data collected in the past three years, the Ambient Monitoring Section has been removed.

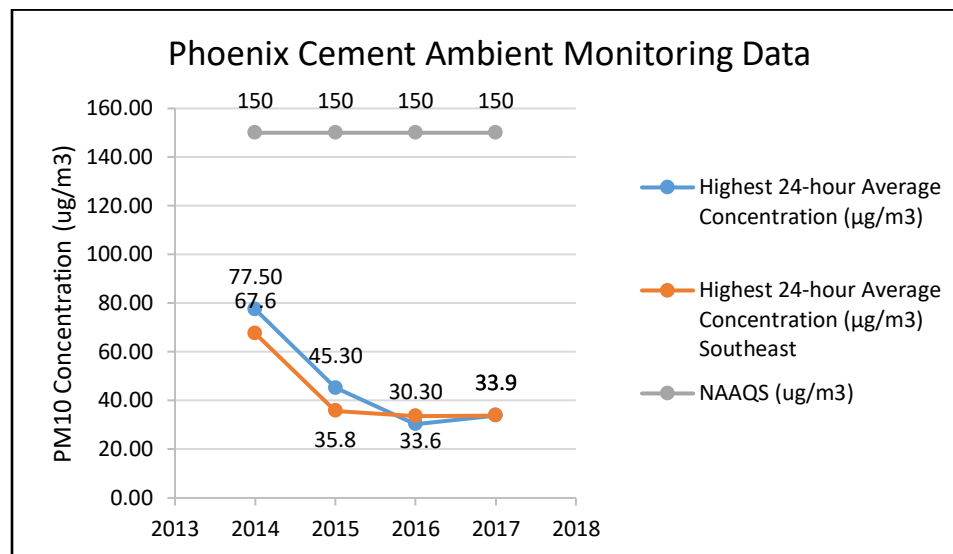


Figure 1 Highest 24-hour Average Concentration (µg/m³)

## VII. COMPLIANCE HISTORY

There have been four facility inspections and eleven compliance certification file reviews performed for this facility during the term of the previous permit. No cases or violations have developed as a result of these inspections and file reviews.

## VIII. LIST OF ABBREVIATIONS

A.A.C.	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
HAP	Hazardous Air Pollutant
hp	Horsepower
hr	Hour
lb	Pound
m	Meter
µg/m <sup>3</sup>	Microgram per Cubic Meter
NAAQS	National Ambient Air Quality Standard
NO <sub>x</sub>	Nitrogen Oxide
NO <sub>2</sub>	Nitrogen Dioxide
O <sub>3</sub>	Ozone
PM	Particulate Matter
PM <sub>10</sub>	Particulate Matter Nominally less than 10 Micrometers
PTE	Potential-to-Emit
SO <sub>2</sub>	Sulfur Dioxide
TPY	Tons per Year
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
yr	Year